



Journal Homepage: - [www.journalijar.com](http://www.journalijar.com)

## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/19844

DOI URL: <http://dx.doi.org/10.21474/IJAR01/19844>



### RESEARCH ARTICLE

#### ELIMINATE THE BREAK CUTTING MANPOWER THROUGH AUTO FEEDING MACHINE IN TYRE BUILDING

Surya Geethan Devisree Arun Vasanthageethan  
Lake Norman High School.

#### Manuscript Info

##### Manuscript History

Received: 07 September 2024

Final Accepted: 14 October 2024

Published: November 2024

##### Key words:-

Eliminate, Manpower, Efficiency,  
Production Rate, Movable Machine, etc

#### Abstract

This paper work is to eliminate the break cutting manpower through auto feeding machine in tyre building machine. For all type of tyre, that manufactured in a company, has three number of ply (layer). But in '2-by-2-brk' type of tyre they uses 4 ply. The 4th ply will be feed by external manpower at the required length. So, there is a need of additional manpower (to cut the ply at required length) and addition space in the industry (for the ply cutting machine). Now we use a portable/movable machine to feed the ply at the required length at the required time directly to the worker (employee).

Copyright, IJAR, 2024,. All rights reserved.

#### Introduction:-

A tire is the rubber covering that is wrapped around a wheel to create a gentle touch with the road. It usually encircles an inflated inner tube. The only component of the car that comes into contact with the road is the tire. This implies that they have command over your steering, braking, acceleration, and road bump absorption. Therefore, it is clear that having high-quality tires is crucial to our driving experience.

We need tyre to

- Support the vehicle weight, including payload (load carrying capability)
- Cushioning and enveloping shock-absorbing rods
- Modifying and preserving the direction of travel (steering stability and reaction during cornering)
- Minimal road vibration and noise;
- Safe operation at high speeds;
- Low rolling resistance Ability
- comfort and aesthetics

There are many types of tyres available in the market and all does not provide the same performance level. Certain tyres provide much better traction in wet weather or snow, while others provide smoother rolling at high speeds for better fuel consumption and reducednoise.

Synthetic rubber, carbon black, sulphur, and other chemicals are used as the raw materials for manufacturing a tyre. After all the manufacturing process this raw material is extracted out as a tyre.

The manufacturing processes are

- Mixing of rawmaterial
- Extruding

**Corresponding Author:- Surya Geethan Devisree Arun Vasanthageethan**  
Address:- Lake Norman High School.

- Milling
  - Calendaring
  - Biascutting
  - Green tyrebuilding
  - Pre-curingprocess
  - Types of tyres are,
  - Solidtyre,
  - Pneumatictyre,
  - Radialtyre,
  - Biastyre,
  - Tubesstyre,
  - Tube tyre.
- Curing
  - Post curingprocess
  - Qualityanalysis
  - Dispatch.

### Background

Iron bands were used as the earliest tires, and they were mounted on the wooden wheels of wagons and carts. Fortunately, things changed when rubber was discovered. In the middle of the 1800s, the first rubber-made tires were introduced. RW Thomson created and patented the pneumatic or air-filled tire in 1845. This type of tire absorbs shock from the road by using air inside the tire. Andre and Edouard Michelin installed the first pneumatic tire on a car in 1895. Throughout the 1920s and 1930s, tires stayed essentially the same until 1948, when Michelin debuted steel-belted radial tires. The American public didn't demand more fuel-efficient cars until the 1970s, during a fuel crisis, as a result of the rising price of gasoline.

As a result, vehicles that could readily fit the high mileage radial tires were introduced. By 1983, radial tyres were standard on all new American vehicles.

### Radial tyre

Arthur W. Savage, a San Diego, California-based inventor and tire maker from 1915 to 1919, received a patent for the first radial tire designs in 1915. In 1949, Savage's patents expired. Following consumer reports demonstrating the superiority of the radial design in 1968, radial tire manufacture surged to 100% of the North American market.

As a result, vehicles that could readily fit the high mileage radial tires were introduced. By 1983, radial tyres were standard on all new American vehicles.



**Figure 1:-** First car designed with radial tyres standard from launch: 1948 Citroën 2CV.



**Figure 2:-** First American car fitted with radial tyres standard: 1970 Lincoln Continental Mark III

JK Tyre is the pioneer of Radial Technology in India. It was the first company to launch radials in the passenger car segment way back in 1977. With a vast experience and understanding of operating conditions in India, JK Tyre brings you the best technology for your cars & SUVs.

### Tubeless tyres:

Tubeless tires, also known as tires in some Commonwealth countries, are pneumatic tires that don't need an inner tube. The pressure of the air inside the tire forces the continuous ribs that are molded into the tyre's bead to seal with the flanges of the metal rim of the wheel, unlike pneumatic tyres that require a separate inner tube.

The air-filled, or pneumatic, tires were created in 1888 by John Dunlop. Goodyear Tyre Company's Litchfield was the first to patent a tubeless tire. Nevertheless, it wasn't used for commercial purposes until the Packard in 1954. Mountable rims, which let drivers to repair their own flats, were introduced in 1904. Frank Seiberling created grooved tires in 1908, which increased road traction.

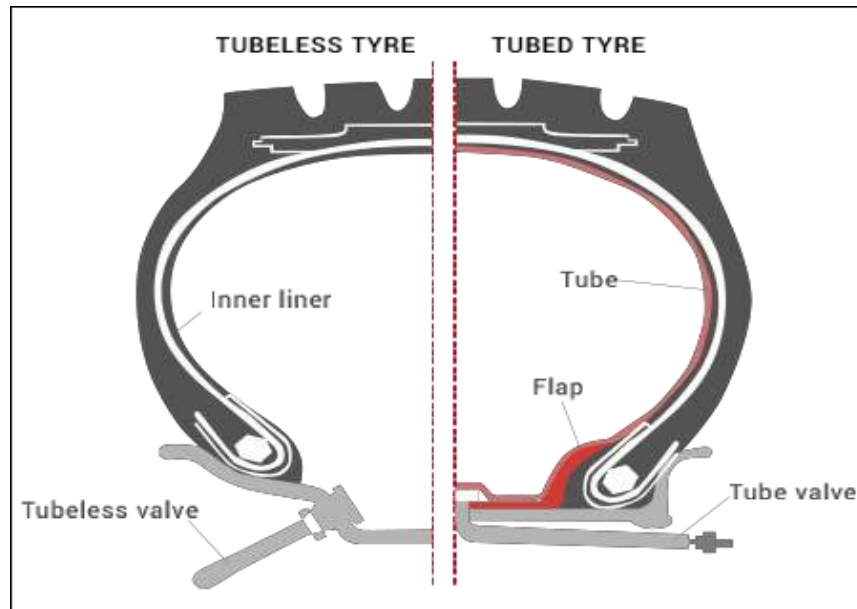


Figure. 3:- Tubless tyre.

#### Tyre Manufacturing:

There are about 455 tire manufacturers worldwide that produce pneumatic tires using comparatively uniform machinery and procedures. The largest consumer of natural rubber is the tire sector, which produces more than 1 billion tires annually worldwide. In order to create the many specialized parts that are combined and cured, tire factories begin with bulk raw materials such synthetic rubber (which makes up 60% to 70% of all rubber used in the tire industry), carbon black, and chemicals. The parts that go into making a tire, the many materials that are utilized, the equipment and production procedures, and the overall business plan are all covered in this article.

Traditionally, tire plants are separated into five sections, each of which carries out specialized tasks. Typically, these function as separate factories inside a factory.

The five departments are:

- Compounding and mixing,
- Compound preparation,
- Tyrebuilding,
- Curing,
- Finalfinish.

#### Problems Faced In Tyre Building:

In tyres there are 3 numbers of ply are used during the building process. So there are only 3 ply specified machines are available. But in the "2-by-2 brk" type they use four layers. The fourth layer is feed in the machine manually. That layer is initially cutted into pieces at the required length at a separate machine with the help of another manpower. So that an extra manpower is required along with additional machine and additional workspace.

#### Previous method

- It is stationary machine, so manpower is required to transport the material to the machine.
- It requires more space.
- It needs more time that includes the feeding the ply, measuring, cutting, transporting.

- Additional space is required to store the cuttedply.



Figure. 1:- Previous method in Manufacturing.

Design of machine:

ISOMETRIC  
VIEW

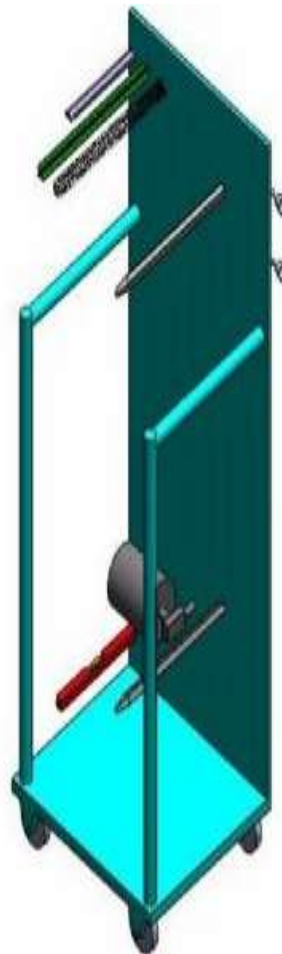
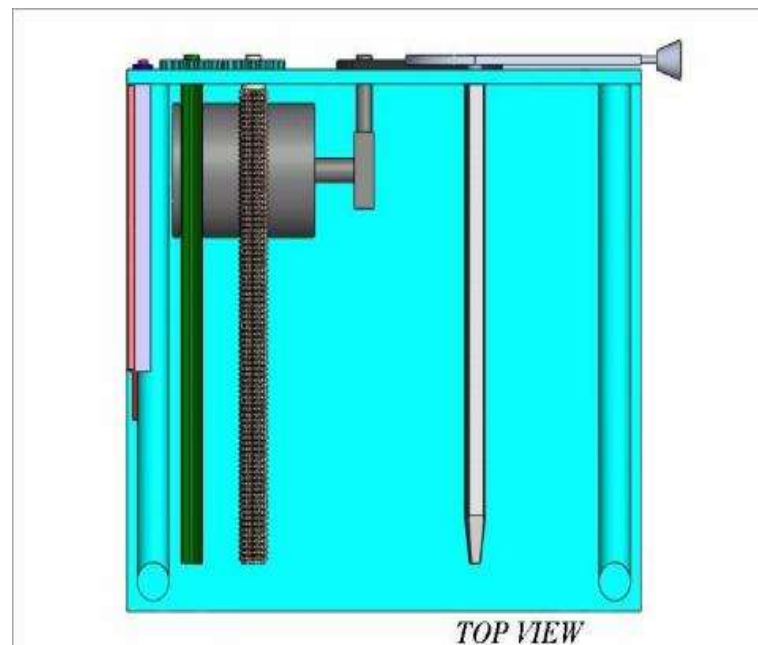




Figure 4:- New design.



**CALCULATION FOR TIME AND FLOOR SPACE REDUCTION:**

**Floor space Reduced:**

$$7.5 \times 1.5 = 11.25 \text{m}^2$$

**Time for transporting the ply from cutter machine:**

$$\text{Transportation} = 30 \text{sec} / 10 \text{ply} [3 \text{ sec for 1 ply}]$$

No. of tyre = 400 tyre/day  
 Time = 1200sec/day = 20min/day  
 = 10hour/month  
 = 120 hours/year = 7200min/year  
 So, 2400 tyre can be manufactured extra per year.

#### Man power reduction :( Elimination)

1 man power = 12000Rs salary/month  
 12000x12 = 144000Rs/year  
 Money saved = 144000Rs/year

#### Results and Discussion:-

The work has eliminated the breaker cutting manpower through auto feeding machine in tyre building section. Thus the manpower has been eliminated by introducing a new machine which is movable with a controlled motor setup.

This will feed the ply directly to the worker thus eliminates the following:

- Additional manpower
- Cutter machine
- Cutting time
- Transmitting time
- Floor space.

This can be overcome by have a separate machine to feed the needed forth ply directly to the worker. That one should be movable and automated, so that it can be moved to the required machine at the required time.

When the breaker cutting manpower is eliminated, it will result in the following advantage:

- Floor space for the cutting machine is removed so that we can use it for other purposes.
- Manpower is reduced.
- No need of huge cutting machines.
- Cutting time and transmitting time is reduced a lot.

#### Conclusion:-

So that we designed a trolley with automatic feed of the additional ply to the worker at the required length. The length can be controlled by using a sensor. That sensor will operate the motor to feed the ply to the worker. The length can also be changed according to the required one. There is an adjustable lever to adjust the length of the ply. The purpose of the trolley type is due to the machine availability. This type of ply will be done very rarely and at any machine which is free from the scheduled work so the designed one should be movable where ever we needed and then when the need is over the machine has to move away from the machine.

A motor is available in this setup to rotate and feed the ply to worker when needed at required length. The motor is operated only when the sensor signals negative. The type of sensor we use in this is the proximity sensor. It detects the presence of the ply. If it can't detect the ply it starts the motor and feed the ply to worker. The sensor height can be adjusted to have a variable height of ply as required.

#### Reference:-

1. "Rubber, Natural – Chemical Economics Handbook" IHS Markit. Retrieved 2017-07-21,
2. "An unknown object: the tyre – Materials". Michelin The tyre digest. Retrieved 2017-07-21,
3. SAMUEL H.HUANG, John P. Dismukes, (2003), 'Manufacturing productivity improvement using effectiveness metrics and simulation analysis'. International journal of production research, Vol. 41, No.3, pp.513-527,
4. Sadiqtsis, Ioannis (February 21, 2012). "Automobile Tyres—A Potential Source of Highly Carcinogenic Dibenzopyrenes to the Environment". Environmental Science & Technology. 46: 3326–3334. doi:10.1021/es204257d

5. Spiegelhalter, B. (September 1983). "Occupational nitrosamine exposure. 1. Rubber and tyre industry". *Carcinogenesis*. 4: 1147–1152. doi:10.1093/carcin/4.9.1147
6. Outlook for Tyre industry looks robust for near future Nov. 22 2014, [http://www.indiatrader.com/UploadResearch/635522563529111250\\_Sector%20Report\\_TYRES\\_.pdf](http://www.indiatrader.com/UploadResearch/635522563529111250_Sector%20Report_TYRES_.pdf).
7. International Monetary Fund world - Economic outlook (WEO) update -Cross Currents January 2014 - <http://www.imf.org/external/pubs/ft/weo/2014/update/01/>
8. Tyres – capital Market – Dec. 8 -21 2014 [http://subscribers.capitalmarket.com/CmMagazineMagDisplay\\_CL.asp?SNo=8006&SectionName=Sector&Mdate=12/8/2014&volno=29&issno=21&MenuOpt=0501](http://subscribers.capitalmarket.com/CmMagazineMagDisplay_CL.asp?SNo=8006&SectionName=Sector&Mdate=12/8/2014&volno=29&issno=21&MenuOpt=0501).
9. Mr. Dilipkumarjha - Tyre manufacturers mull increase use of synthetic rubber to protect margins – *Business Standard* – October 22, 2014.
10. Tyre sector May 2015, sector coverage, Canara Bank Securities Ltd. [canmoney.in](http://canmoney.in).
11. Iyer, PK & Upadhyay, V. 2008. R&D in Indian Tyre Industry: Socio-Economic Determinants. SSRN. Working Paper series. (Paper accepted on September 24, 2008).
12. "Tyre Building Machine" Allen-Bradley.